

516. m. 16
7

C E R T A I N
New Hypotheses,
O R
Fundamental Principles,
F O R
The Perspicuous Illustration, and additional Improvement
(if not Compleat Perfection) of the present System of
G E O M E T R Y,
And particularly of
Hydrometry and *Navigation*,
Which are plainly Demonstrable to be True, and not
Difficult, both in *Theory* and *Practice*, upon the *Globe* of the
Universe, and upon the *Navigators Compass*, &c.
A N D
By means whereof the
D I S T A N C E and L O N G I T U D E

At Sea, as well as at Land, are Discover'd and Determin'd,
with more Exactness than the LATITUDE is now known
and ascertain'd. And the *Latitude* is also Corrected; the *Va-
riation* of the *Magnetical Needle* accounted for; and the
whole *Terraqueous Globe* more Naturally, Intelligibly, and
Accurately Projected and Delineated.

By Henry Wadson, of London, Gent.

London Printed for the Author, and Sold by J. Roberts at the Oxford
Arms in Warwick-Lane, 1717. Price One Shilling.

CERTAIN
 New Hypotheses,
 OF
 Fundamental Principles
 OF
 GEOMETRY.
 And particularly of
 Astronomy and Navigation,
 Which are plainly Demonstrable to be True, and not
 Different both in Theory and Practice upon the Old
 Systems, and upon the Newer Systems, &c.
 AND
 By means whereof the
 DISTANCE and LONGITUDE
 As yet, as well as Land are Discover'd and Determin'd,
 with more Exactness than the LATITUDE is now known
 and ascertain'd. And the Latitude is also Corrected; the Na-
 vigation of the Magnetic Needle accounted for; and the
 whole Terrestrial Globe more Naturally, Intelligibly, and
 Accurately Projected and Delimited.

By Henry Baskin, of London, Gent.

London Printed for the Author, and Sold by J. Roberts at the Oxford
 Street in Warwick Lane, 1717. Price One Shilling.

CERTAIN New Hypotheses, &c.

IN the Beginning the Omnipotent and Self-existing *Tri-Una-Deity* (to whom we, and the rest of Nature, owe our Being, and consequently our utmost Adoration) did out of the unlimited and incomprehensible Eternity and Ubiquity of the Immaterial Mansions which he Inhabited, select, canton, and mete out according to the Council of his own Will, a certain limited and comprehensible Parenthesis, or Circular Portion, call'd *Time* and *Place*; and in this Vacuum of Place (in the very Center, or Womb thereof) did by the All-creating energy of his Word, produce a formelefs *Chaos* of Elementary Materiality; and out of this Proto-plastick Matter, did Create, Form, Fashion, or Configure, and by the vivifying influence of his Spirit, spring into Motion, the most perfect and stupendous Exemplars, or Models of Architecture, and Universal Machination, the Spherical Macrocosms of the Heavens and the Earth; consubstisting in a perpetually Varying and Vicissitudinary, and yet the most exactly Proportionable, Regular, Harmonious, and Beautiful Form, Order and Symetry; Infomuch, that adequate to a Man's reading and proficiency in this grand System of *Human Science*, the *Natural* or *Mathematical Bible*, not only his Skill and Judgment in all Things artificial and subservient is extended, but also his Apprehension and Idea of the *Divine Majesty* is thereby Naturally rendered the more clear and capacious; for there is in Nature a coherent Gradation, or Concatenation to direct and lead a Man to the Almighty Author thereof: And it's a palpable Paradox, for a true *Naturalist* to be a real *Atheist*, thro' Ignorance, or for want of Conscientious Conviction; But if such Wise Men of this World surrender and prostitute the Sovereignty, or Free-agency of their Knowledge, Wills, and Affections to be so much byass'd, impos'd upon, prepossess'd, or ingross'd by the sordid gratifications of their Carnal Appetites, or other Temporal or Diabolical Delusions, as obstinately to repugn, or supinely or inconsiderately to disregard, vilipend, or connive at the perfectly illuminating and attractive Emanations and Influences of God's Holy Spirit, under the present Evangelical Dispensation,

Dispensation, added to the Legal and Natural Institutions; What Divine Impression is the abstracted Light of Nature capable of making upon such obdurate and apostatical Objects? This single Twine must needs be utterly insufficient to draw such, by whom that *Threefold Cord* is so easily broken.

But to return from this casual Excursion, As the Worlds consist of, and are circumscrib'd by *Time* and *Place*, (and all Things therein referr to, and depend on these *first Principles*) so the All-wise Creator hath constituted that great Luminary, the Sun, in the Firmament, amongst other Purposes, for the principal and most observable Dimensuration and Calculation of those immense Orbs of the Heavens and the Earth into periodical and significant Divisions or Distinctions, and the minutest Particles of *Time* and *Place*: And, on the other hand, the Terraqueous Globe, by it's Arches of Spherical Circularity, dimensurates and calculates the Altitudes, Amplitudes, Revolutions and Magnitudes of the Cælestial Spheres and Phænomena: But whether the Sun be the Dimensurator, or the Standard for Dimensuration, ther's a Dispute between *Tycho* and *Copernicus*; and it not being material to my present Subject, whether Either or Neither of them be in the Right (by reason the Terraqueous Globe and the Cælestial Spheres and Phænomena are reciprocal Standards of Dimensuration and Calculation to each other) I shall not now enter into the Controversy; for it's palpably manifest and incontestible, according to common Observation (and therefore sufficient and effectual to my Purpose) That there is a Duplicity of Motion either in the Sun or in the Earth, or a Singularity of Motion in each of them; the one a swift progressive Revolution, circulating the whole Terraqueous Globe in the Equatorial, or some other as comprehensive, tho' oblique Circle, in about 24 Hours; and the other a slow, stated and limited Progression and Retrogradation from Tropick to Tropick, or more Naturally, from the Equator to one of the Tropicks and the Reverse thereof, in the space of six Months.

And here I must not omit to Observe and Distinguish in a very especial manner, That these two Motions are not pure unmixt and truly Parallel, but compounded of a third Motion more considerable than both, as being specifically essential to the ascertaining the *Longitude at Sea*; and that is a *Motion* Oblique, Transcirculative, or Traverse to the Horizontal Parallels of the Globe: For from the very moment the Sun touches and centers in the same original *Meridian Punctum* of the Equator, where it primarily darted out it's perpendicular Beams at the Creation, it commenceth it's Traverses by an adæquation of Diurnal Proportions towards one of the Tropicks and Poles; so that it's continually Traversing, either Progressive or Retrograde, within the confines of the Zodiacal Orbit, in respect to the Body of the Sun, but it's oblique Radij, or Lumination extends 90 Degrees further than the perpendicular Beams thereof; and therefore this Traversing may well be accounted the principal Motion, and more especially

especially in regard to it's Intermediating and Uniting the other two Motions together, and consolidating the whole three into one Conjoint Motion, which resembles the Contortion of a Screw, by moving Circularly, Traversely and Progressively, by certain Rules of Proportion, all at once; and for these Reasons it may be Emphatically Styled a *Tri-Unity* of Motion, concentricating in a perpetual Transcirculation; and no doubt but it's a Natural Hieroglyphick of the *Tri-Una-Deity*; and as it consequentially results and proceeds from, so it must needs be a certain Indication, and Diagnostick of the Universally Uniform, or Homogenous Circularity of the Celestial and Terrestrial Spheres, and that the Concavity of the one exactly corresponds with the Convexity of the other.

Now, *Geometry* being the Mensuration of the Convex, or Spherical Superficies of the Terraqueous Globe, which is of a perfectly Symetrical or Trigonometrical Nature, must consequently consist of these Three Essentials (*viz.*) *Latitude*, *Longitude*, and *Distance*; so that the Parallel and Meridian Circles are insufficient of themselves to complete the System of Geometry, or to effect the Practical Performance thereof, either in *Distance* or *Longitude*, at Sea or at Land, without the immediate Superintendence, Concurrence, or Coalition of the Traverse, or Oblique Circles, which are of two distinct Kinds, and are commonly called *Vertical Circles of the Horizon*, and *Parallel Circles of the Sun*; but the excellent and very extensive use of them hath been hitherto imperfectly understood, and not successfully applyed to the ascertaining the *Longitude* at Sea, but only the Points of the Horizon, for Direction of the Course in Navigation, and for Regulating the Variation of the Needle; tho' the same are the peculiar Natural Circles, by means whereof the *Longitude* and *Distance* at Sea (as well as at Land) may, even upon the Navigator's Compass, alone in most Cases, as well as otherwise by the Assistance of an Horological Regulator or common Clock, and still more exactly than both by the Quotidian and extraordinary Variations of the Amplitudinary Arches of the Solar Parallel Circles, be united, associated, and carryed along with the *Latitude*; in the Traverses of *Latitude* (severally distinguished by the Points or Degrees of the Horizon, or by the continual Differences of the Solar Transcirculatory Positions or Azimuths) discover and determine the Distances and Longitude of particular Places, and consequently the Longitude of the Universe; as I shall evidently Demonstrate by the subsequent Calculations; and I shall commence with some Operations on the Navigator's Compass.

As First, If the Course of Steering be N. W. — The Vertical or Traverse upon the Horizon, will be 45. Deg. — Then at any time when the Latitude is taken, suppose it prove to be 3 Degs in Difference from the Port the Ship commenced her Voyage, or from any preceding Observation of the Latitude — and

the Longitude will be the same, that is to say 3 Deg. by reason this Traverse of 45 Deg. is an exact Medium or mean Proportional between N. and W. or between the two extremes of 0 Degrees, and 90, and Intermediates and Unites Longitude and Latitude together in equal Proportions, viz. a Dimidium of each — And lastly, if the Latitude and Longitude be added together, the Total thereof will be 6 degrees for the direct Horizontal Distance.

Secondly, Suppose the Point of Bearing be W. by N. — the Traverse will be 11 deg. 15 min. — Then if the Latitude be 5 deg. — the Longitude will be 35 deg. — because the Course of Steering is 7 parts in Longitude, and but one in Latitude; which added together, amounts to 40 deg. for Distance.

Thirdly, In case the Rhomb, or Run of the Ship be N. N. W. the Traverse will be 67 deg. 30 min. — and if the difference of Latitude be 16 min. — the Longitude will be 4 min. — for that the Ship hath Sail'd six parts out of eight in Latitude, and but two parts in Longitude (4 being $\frac{1}{2}$ or $\frac{1}{4}$ of 16) which 16 min. in Latitude with the 2 min. in Longitude, makes 18 min. for Distance.

And by this generall Rule of Geometrical Proportion, operating by Verticalls or Traverses on the Horizon, any larger or lesser Calculations of Longitude and Distance, may be made upon the Mariners Compass by knowing the Latitude; but whensoever the Traverse is varied or shifted without taking the Latitude (upon which this Method of Calculation is founded) then both the Distance and Longitude are lost, and cannot in such a Case be any farther carryed on or retained, or the Rate of the Ships sailing ascertain'd any otherwise than by Judgment or Estimation. But notwithstanding this Traversing (when diversified without knowing the Latitude, as aforesaid, which I must confess too frequently happens thro' absolute Necessity, viz. The Variation of the Winds, and also when a Ship's Course is direct upon a Parallel Circle, or due Longitude) doth then cease to be instrumental, or conducive to the Safety of Ships as before, when attended with the Latitude, and thereby render'd Productive of the Longitude and Distance, yet the true knowledge of Traversing still remains absolutely necessary and useful for Steering the nearest Courses, and is Essential to the acceleration or quickness of Voyages; and therefore the better to Explicate the Doctrine of Traverses (which is one of the most Practical Principles in Navigation) but still remains some what obscure and intricate, I have drawn a Scheme to Exhibit the same more naturally Ideal, and Intelligible; and to that end it's projected on a Quarter of the Globe, represented Elliptically from E. to W. on the Equator, which distinguishes and determines by the degrees, and Points of the Horizon (which last for the more succinct and ready appropriating the same, I have augmented to the

the Number of 48) the several different Commencements and Extents of all Traverses; and what Collateral or Oblique Traverses, even to a full Quadrant of a Circle, are as near and short as Direct and Perpendicular ones; the Operation of which Scheme is by way of Compound or double Spherical Trigonometry, that is to say, Direct and Reverse; and will Commutatively serve, by a Transposition only of the Horizontal Points, for all the other Quarters of the Globe, in either sort of Hemisphere, Æquatorial or Polar.

The Second Method.

I shall proceed, in the next Place, to shew a Method for finding the LONGITUDE, both at Sea and Land, by the assistance of a Clock.

A Debate still depending, Whether the difference of Meridians can be adjusted and indicated by a Clock, I shall attempt a Discussion thereof by the subsequent Arguments. *First*, If the Natural Day (consisting of Light and Darkness conjunctly, whether in an Equality or Disparity of Proportion; or otherwise of Light and Darkness disjunctly, as is peculiar to the Polar Circles; and dimensurated by a complete Revolution of the Lumination of the Sun round the Æquatorial, and the other Parallel Circles of the Terrestrial Sphere, from the true Meridian of one Day to the same Punctum of the next Day) comprehends exactly 24 Hours, of 60 Minutes to the Hour, and 60 Seconds to the Minute, or a very little more or less, conformable to the present general Computation and equation of Time stated, pursuant to the Annual Precession; then a Clock, as now projected and Divided by its duplicate Circulation of 12 Hours, and occasionally Regulated according to the Solar Equation, is indifferently well adapted to determine and ascertain a Natural Day, and consequently the difference of Meridians; tho' cannot say, that it's a Perfect Performance, but capable of some Retoration and Improvement; because it should Naturally have a Diurnal Equation throughout the whole Year, correspondent to that of the Sun, as I shall herein after Demonstrate when I come to Treat of the Physical Adequation, or Symmetrical Proportion and Agreement of Time and Place. My Second Argument is, That in the same measure of Exactness as this complement of a Natural Day is exhibited by a Clock in any one Latitude, it will continue and hold in all the Variations of Latitude; for the Diurnal Solar Circulation is in every Latitude equal and commensurate in Time (tho' not in respect to the Dimensions of Place) and therefore a Clock (setting aside the Imperfection of the Workmanship, and other Accidents, for which I have directed Remedies) will not Vary merely on the account of changing the Latitude; but it's the Variation of the Meridians which causeth the Variation of the Clock, or, more properly, the Clock shews the Variation of the Meridians by the difference of Seconds, Minutes, and Hours between this Twelve-a-Clock Meridian and others; but the difference of Meridians

Meridians, and consequently the Longitude, cannot be certify'd and known by a Clock, without the following Method of Calculation, viz.

	D.	M.	S.
Latitude from the Equator, London, _____	51	32	00
Boston in New-England. _____	42	25	00
Latitude from the North Pole, London, _____	38	28	00
Boston. _____	47	35	00
The Traverse, or Mean Proportional of these Latitudes } from the Pole. _____	43	01	30
The Circumference of this Mean Proportional. _____	172	06	00
The Quotient per Hour of the Division of this Circum- } ference into 24 equal Parts. _____	07	10	15

Then take the Meridian at Boston, and see what Hour it is by the Clock, which suppose to be 4 Hours, 42 Minutes, and 30 Seconds by the Clock, in Variation from this Twelve-a-Clock Meridian; and Multiply the said 7 Deg. 10 Min. and 15 Seconds by the said 4 Hours, 42 Minutes, and 30 Seconds, and it will produce 33 Deg. 45 Min. 55 Seconds, or 2015 Miles, 55 Sec. for the direct Horizontal Distance; which includes, and comprehends both the difference of Meridians, or Longitude, and the difference of Parallels, or Latitude. But the next ensuing Method being more distinct, and determining the particular contents of Latitude, Longitude, and Distance separately, is therefore preferable to this conglomerate Calculation by the Mean Proportional: As for Instance.

	D.	M.	S.
Latitude from the North Pole, London, _____	38	28	00
Amsterdam. _____	37	39	00
The Difference of these Latitudes. _____	00	49	00
Then by the Clock see the difference of Meridian, } which suppose to be _____	00	19	00
Then the Circumference of Amsterdam, Latitude } being Calculated, amount to _____	150	36	00
And Divided by 24, the Quotient is per Hour _____	06	16	30
The Proportion whereto, for the said 19 Min. (the } difference of Meridians.) _____	01	59	13

so that from London to Amsterdam,

	D.	M.	S.	Miles.	Sec.
The Latitude is _____	00	49	00	49	00
The Longitude _____	01	59	13	119	13
And the Distance (being the } Total of both.) _____	02	48	13	168	13

Another

Another Example somewhat Diversified.

	D.	M.	S.
Latitude North, London. 38 28 ——— Moscow ———	34	26	00
Difference of Latitude ———	04	02	00
Circumference of Moscow Latitude ———	137	44	00
Horary Quotient of this Circumference ———	05	44	08
Difference of Meridians by the Clock — 2 Hours 35 Min.			
It's Proportion of the said Circumference ———	14	48	20

Wherefore between London, and Moscow,

	Miles.	Sec.
The Difference in Latitude is ———	241	00
In Longitude ———	888	20
And the Total Distance ———	1130	20

N. B. The Circumference of the Minor, or less comprehensive Parallel Circle must always be taken, as in these last Examples of Amsterdam and Moscow Latitudes; otherwise the Calculations will be Erroneous.

Note also, That taking the Latitude and Longitude, in small differences for every Days use, is performed by the very same Method as before directed; but the Diurnal Variations thereof must be enter'd in a Journal, and computed together at the Expiration of the Voyage, or at any Interjacent Port; and being compared with the Calculation of the direct Distance of such Port, will shew the Quantum of the Ships Deviating Traverses or Dead-way, occasion'd by contrary Winds, the ob-mubilations of the Celestial Phenomina, or otherwise; and the Conversion of the Longitude from one particular Place or Port to another into the general Longitude of the Universe, amounting to no more than an Addition or Substraction of the difference of Meridians between the first Meridian, and the Meridian of such particular Place or Port from whence the Longitude is at any time commenced, according as the same is Scituate Eastward or Westward there from (as no Man can be Ignorant of) doth therefore require no further Explanation.

It now remains for me to remove and obviate the extant and future objections against the common Horological Machine or Clock, on account of the Imperfection of the Work, or other accidents, as the Agitation of a Ship, Variations of Climates and Seasons, &c. which might cause some defects in it's true keeping of Time: In reference to the first; The Work indeed ought to be very exact and not Subject to any greater uncertain Variation than 60 Seconds or one Minute per Month, if possible; because the Diurnal Course of the Solar Lumination upon the

the great Æquatorial Parallel Circle amounts to more than 15 Miles per Minute: Now the Exactness of the Work consists in the Accurate and true Projection of the Dimensions and Divisions of the Movement, that the Circulation thereof may be nicely comensurate to 12 Hours, of 60 Minutes to the Hour, and 60 Seconds to the Min. but if the Movement should happen to be not so well contriv'd and proportion'd, insomuch that it wants, or exceeds several Seconds, or even Minutes in a single Circulation thereof; yet, if the Materials and Workmanship be good, solid and substantial, and will keep to that Standard of Variation, it will perform as well, as if ever so exactly divided; only it will occasion some small Trouble in making Allowances for the Diurnal Variations of the Clock, by way of Addition to, or Subtraction from the Calculations of the Differences of Meridians; but in case the Materials be soft, or unsound, or the Work rough and untrue, then such a Piece is not fit for this or any other use, because it will grow Casually Erroneous, and can by no means be reduced to any Standard of Certainty: And as to the Agitation of the Ship, a Method may be contriv'd to suspend a Clock in the very Center of a Ship, in such a sort of stated Position, that it shall not be liable to any precipitate, impetuous, or saltative Motion, but only to a gentle sliding Inclination, truly Sympathetical (tho' in a very exiguous ratio of Proportion) to the Motion or Agitation of the Ship; so that it shall have no manner of Counterballance or perceptible impulse on the Vibration of the Pendulum or Movement of the Clock [and in this method a Compass in a Ship ought to be more accurately suspended, as far as is consonant with the appropriated Use thereof] and in order to prevent and exclude the Variation of Climates and Seasons from having any Malignant Influence on a Clock; the Oyl used about the Movement of the Clock should be in some Measure (if possible) Spiritually exalted or volatiliz'd, so that it might be render'd of a more perfect tenuity and fixation of Nature, which would not be so obnoxious and prone to attenuation, or condensation even in the extreme Variations of the Torrid or Frigid Zones, or Seasons of the Year; and the Case of a Clock ought to be contriv'd so very close and compact, and as it were imbalm'd in Multiplicate Investure, that it shou'd not admit the penetration of the clearest Air, much less when it's condensed and vitiated by Moisture, Smoke, or Dust; and here a Quere naturally arises, whether at the several Times of winding up the Clock (if the same cannot be performed without opening the Case) a rarefaction of the Air in the Place or Inclosure, where the Clock is Station'd, by means of the pneumattick Machine or Air-Pump, will not be expedient and conducive to the Conservation of the Horological Motion in the greatest Purity and Veracity: And lastly, before I quit this Topick, I must not omitt to observe, That a common Clock is more Essentially and Completely adapted to adjust and indicate the Difference of Meridians than the late new Projected Automaton; which, directly contrary to the Ætymology or true Nature of the Thing, was divulged under the Hyperbolical appellation, or Title of an Horologe; for it being a Movement projected into 100 or other Multitude

Multitude of Divisions in current Numerical Figures, requires a Journal to be kept, and a tedious Calculation always to be made, in order to reduce the same into an Horological Method, or into the sundry Denominations of Seconds, Minutes, and Hours, &c. Which a common Clock is ready Calculated for, and shews immediately upon Inspection only, and a common Clock moreover hath all the good Properties of that diversify'd Movement.

The Third Method.

The Third Method, *Whereby I propos'd to discover and determine the LONGITUDE at Sea, is Establish'd upon the quotidian, and extraordinary Variations of the Amplitudinary Arches and Azimuths of the Solar Parallel Circles.*

I Know it has been positively, and even Ludibriously objected, and asserted by some Persons of pretended extraordinary Learning and Judgment in the Mathematicks, that its impossible the Longitude at Sea should be discover'd and determin'd by Diurnal Celestial Observations; but the real profundity or extent of their Science I hope to discover, and determine by Demonstrations as Evident as the Meridian Sun. And in the first place, That an Infallible Foundation may be laid for such a weighty and curious Superstructure; it's absolutely necessary that the Declination of the Sun, &c. be Calculated into adequate Proportions for every Day in the Year, according to the true Nature thereof. For I cannot find any such Calculation or Table yet extant; and therefore shall speedily prepare one my self; and then by means of such a symetrical and truly gradual Computation, the Rising, Meridian Altitude, and Setting of the Sun, and consequently the true times of Break of Day, and approach of Night, with the different Lengths of both, will (by the Quantity or Contents of the Diurnal Amplitudinary Arches of the Solar Parallel Circles and Positions of the Azimuths) be more naturally and exactly regulated, indicated and adapted for the true ascertaining and determining the Latitude as well as the Longitude, any Hour of the Day, and particularly in the Morning, at Noon, and at Night.

Upon this Foundation the Superstructure may be Successfully erected in manner following.

When you commence a Voyage, enter in your Journal the Port or Place of the Ships Departure, and the Day of the Month, with the Hour, Minute and Second; and also the Declination of the Sun, with the Rising, Meridian Altitude, and Setting thereof, (that is, say) the total Diurnal Arch consisting of the Eastern and Western Amplitudes, for that Day, and for every Day in the Year, in that same Port or Place of Departure; because this is the particular Standard you com-

mence

mence from, and whereby you must regulate and commensurate your Calculations of *Latitude* and *Longitude*; and will be ready upon Inspection without the trouble of Computation.

Then, if your Departure was in the Morning, you may at Noon, when the Sun is in it's Meridian Altitude, take the Declination of the Sun for the *Latitude*, and the Eastern Amplitude of the Sun for the *Longitude*; and compare the same with the Declination, and Eastern Amplitude of the same Day in the Port or Place departed from; and so much as the former exceeds the latter in Declination (according to the Diurnal adæquate proportion thereof) you have gone in *Latitude*, if your Course of Steering was North, or South, with the Declination of the Sun; or if due West, with the Revolution of the Sun, then so much as the Eastern Amplitude exceeds that of the Day for the Place you departed from, you have gone in *Longitude* (making an allowance only for the Traverse Declination of the Day) but if your Course of Steering has been North or South against the Declination of the Sun, or East against the Revolution of the Sun; then in such case, so much as you find the Declination and Eastern Amplitude of the Sun severally, to be less than in the Place you departed from, the same will be your *Latitude* and *Longitude* — But suppose you have Steer'd any Collateral or interjacent Point of the Compass between North and East, or North and West, then so much as you find the Eastern Amplitude of the Sun exceeds, or falls short of the Declination thereof, the same will be your *Longitude*, and the Declination the *Latitude* — In like manner at Night, you may take the Declination and Western Amplitude of the Sun, to know your *Latitude* and *Longitude*, and on the Morrow Morning you may take the Azimuth or Rising of the Sun, and compare it with that of the same Day in the place you departed from; and the difference, whether by Increase or Decrease will shew the *Latitude*; and if you compare it with the Azimuth or setting of the Sun the Night before, you will find by the quantity or dimensions of the Solar Arch of the Antipodes, whether the intervening Night was longer or shorter, then the difference of *Latitude*, or the Declination of the Sun could occasion the same to be: And if it was, then so much must be placed to the Account of *Longitude* — And thus you may proceed on to know your *Latitude* and *Longitude* any other Day, or any Hour of the Day, by comparing and commensurating the variations or differences of the Declination, Amplitudes, and Azimuths of the Sun, with those of the same Day, and same Hour of the Day in the Place you commenced your Voyage from, as aforesaid; and if after any Number of Days you compute and add together all your Diurnal calculations, made according to the various Courses you Steer'd, and compare the same with the Difference between the Place where you then are, and that you commenced your Voyage from, you will then see how far you have digressed out of your nearest and shortest Courses. The like Observations as from the Sun, may be also taken from the rest of the Celestial Phenomena, the Moon and Stars; of all which together I shall shortly Publish natural and true Calculations, adapted to

to the meanest Capacity of any Pretender to the Navigatory Science: Together with plain Distinctions between the Amplitudes proceeding from the Declination of the Celestial Pænomena in *Latitude*, and those caused by the change of Meridians in *Longitude*.

But notwithstanding the Antecedent Methods for finding the *Latitude* and *Longitude* at Sea, are effectual so far as Celestial observations extend; yet I am pressing forwards towards more sublime and Comprehensive acquisitions; which are to find and retain both the *Longitude* and *Latitude*, during the Obnubilations or Disappearances of the Celestial Pænomena, and especially the Sun; and I shall give you a short Sketch of my Progress therein; In the first place, I have consider'd, that whilst the Sun is absconded and invisible, and the Lumination thereof only remains to constitute the Light of the Day, the Lengthening and Shortning of the Day varies in different Proportions, according to the Spissitude of the Obnubilations, or the Condensation or Gravity of the Atmosphere; which I have contriv'd to Ponderate or dimensurate by the Barometer or Weather-Glass, in order to distinguish and ascertain the same into degrees of Light; that the true Times of Break of Day, and approach of Night may be known; which, if it can be effected to any considerable degree of exactness, will serve very well for the Purpose, for by a Clock in a Ship, the time between Break of Day, and approach of Night, and again, between the latter and the former during the Night Season, will be so measured and determin'd, that the *Latitude* and *Longitude* may be known by the Assistance of the Compass; and I have thought upon a more sure and exquisite Method for ascertaining the *Latitude* at all times, and upon that Foundation the *Longitude*, which I have considerable hopes to bring to Perfection, having made several experiments tending to the Confirmation of the Probability thereof, and that is, to suspend the Magnetical Needle in such a Position suitable, to and admittive of it's Natural Polarity and Cadency, as that it will evidently and truly indicate (by its gradual and perceptible Declination, conformable to the Spherical Declivity of the Globe from the Æquator to the Pole) the Elevation of the Pole, or Variation of the *Latitude* in all parts of the Universe.

“ But after all, I must sincerely acknowledge, That the most exquisite and exact Methods and Calculations that can possibly be projected and contriv'd upon the Foundation of the present System of Geometry, for finding and ascertaining the *Latitude* and *Longitude* of the Terraqueous Globe, tho' incontestibly true in Theory, will, notwithstanding, in Use and Practice (that is to say) in the actual Survey and Mensuration thereof by Navigation, or otherwise, prove Fallible and Erroneous; because I am intirely of Opinion, that by the present Geometrical System, the Dimensions of the Globe are not truly commensurate with the Course of the Sun, and till there be discovered and ascertain'd a Physical Adæquation, or Symetrical proportion, concurrence and agreement in Quantity and Dimensions between *Time* and *Place*, or the Magnitude of the Globe and the Diurnal and Annual complete Revolution of the Sun, &c. there will certainly arise extraordinary and undue Variations in Geometrical Practice, proportionable to the extent of Progression therein;

D

“ So

“ So that we shall never attaine to any perfect degree of Exactness in
 “ Navigation or Geography in general, till this Grand and Funda-
 “ mental Article is adjusted and established.— And therefore Finally.
 In order to render the Operations of my Methods and Propositions
 herein before contained the more practically veracious, effectual, and
 successful, I have attempted a more natural, intelligible and accurate
 Projection and Delineation of the *Terraqueous Globe* upon the sub-
 sequent Hypotheses.

*First. That a Quadrant of a great Circle do consist of, and amount
 unto 96 Degrees.*

*Secondly. That the Parallel Circles be 48, and the Meridians
 but 24. And*

*Thirdly. That the Latitude be commenced from the Poles, and the
 the Longitude computed upon every Parallel Circle, and not con-
 fined to the Æquator only.*

In reference to the *First*, One of my principal Arguments for this
 Augmentation of the Globe, is, the preternatural and erroneous Defi-
 ciency of Circularity, or Oblate Spheroidity of the Globe, between the
 Tropical and Polar Circles, according to the present antique Projection
 thereof, which is very palpably and egregiously apparent; for there is
 but 43 Degrees of Latitude constituted between the Tropical and Polar
 Circles; whereas there should be the same distance or contents of La-
 titude (*viz.* 47 Degrees) as there is between the two Tropicks, other-
 wise the Sun, when at either Tropick, doth, (conformable to it's Alti-
 tude upon the Æquator and it's Declination of 23 Deg. and a half,
 on each Side thereof) actually over-reach and surpass by it's oblique
 Radij, or Lumination, the opposite Polar Circle, for the space of 4 Deg.
 by means whereof the Polar Circle is diminished and retrencht into the
 Distance only of 19 Degrees and a half from the Pole; And so con-
 sequently, when the Sun is in the Æquinoctial, it will over-look the
 Pole 4 Degrees, and when at the adjacent Tropick 27 deg. and a half,
 which is reverting it's Lumination 4 deg. before the time of it's Recli-
 nation, and is superfluous, unnecessary, and vain; and therefore an
 Imperfection, which Nature abhors.

My *Second* Argument is deduced from the Variation of the *Mag-
 netical Needle*, which hath hitherto proved such a mystical Abstrusity,
 that it hath layn dormant and absconded from the most Luciferous
 Inquiries of the exquisite Naturalist; but it hath been owing to the
 absolute confidence Men have repos'd in the Philosophy of the Anti-
 ents, and have not themselves examined whether the Theses or Fun-
 damentals thereof were intirely sound and to be depended upon; for
 the difficulty of solving the Variation of the Needle by any other ways
 or means would have naturally given a Turn to their Thoughts upon
 a deficiency in the Globe, if they had not taken it for granted and as an
 undoubted and invinsible Hypothesis, that the Projection thereof was
 true and infallible: But I have taken a contrary Course, being always
 suspicious of trusting to Tradition, and have been at the pains my self
 to Dissect, and make the most critical Inspection (which I have been
 capable of) into the System of Geometry; and as I have found by the
 Extent of the Declination of the Sun, that the Artificial Globe is
 wanting in the true Dimensions of the Natural one, so I am confirm'd
 therein

therein by the (otherwise unaccountable) Variation of the Magnetical Needle; because this Variation increases or decreases according to progression in distance of Latitude and Longitude, and amounts to much about the quantity of Deficiency indicated by the Declination of the Sun; but to obviate the grand *Objection* of a Temporal as well as a Local Variation in the Needle, I have thus much to advance; that such supposed Temporal Variation, is no more than Casual, and thus happens, either when the Magnetical Needle is influenc'd or deprest by an extraordinary ponderosity of the incumbent Atmosphere, or attracted and byass'd by the accidental Vicinity of some unusual quantity of chalybian Matter; for I am of opinion, that the sympathetical affinity and Nature of the Magnet and Iron, is parallel to that of Mercury and Gold; and that the Magnet is subject to an impression of the Atmosphere, and to the amission of it's virtues by the heat of Fire, on account of it's Frigidity of Nature, as well as *Mercury*; and I cannot but think that a Needle made of Gold, and impregnated by the Mercurial contact, will operate in the Navigator's Compass in the like manner as the Magnetical Needle: And further, it has not yet been prov'd by any Observations which can be rely'd upon, that the Magnetical Needle hath any innate Property of Variation in one and the same Place. And I do aver, and will maintaine, and doubt not to evince by incontestible Demonstration, that the Magnetical Needle hath naturally a true and exact Polarity, and no Variation; and that the Variation (other than Casual) erroneously attributed thereto, doth actually arise and proceed from a deficiency of Magnitude in the Artificial Globe, and from the preternatural projection of the Circles of the Sun parallel to the Terrestrial Parallel Circles; whereas the same are really Oblique and Transcirculative.

My *Third* Argument for the Augmentation of the Globe, is grounded upon the Practical Experience of the most able and skilful Navigators, who cannot find, by the best of Instruments, the scituation of Places in the same Latitude they are described to be, upon the Globe, or in any tolerable adjacency thereto: For all which Reasons I have added six Degrees to the Quadrant of a great Circle, or 24 Degrees to it's total Circumference, (that is to say) 16 Degrees on account of the Declination of the Sun, and 8 Degrees for a further augmentation; and I think it will bear a much larger Proportion, which by a little Experience from proper Cælistial Observations may soon be effectually Adjusted and Determined. So that by this New Projection, I propose at present the Declination of the Sun to be 24 Degrees on each Side the Æquator, the Polar Circle to be 24 Degrees from the Pole, and the Distance between the Tropical and Polar Circles to be 48 Degrees, the Complement of both; by means whereof the Declination of the Sun, and the extent of it's Visibility or Lumination will fall Symetrically regular and adæquate upon the Superficies of the Globe.— I have several other very considerable Matters to add, by way of Illustration and Coroboration of what I have already advanced, but I must refer the same to another Opportunity.

